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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
BARTH, VINCENT P	
ART UNIT	**PAPER NUMBER**
2877	

DATE MAILED: 12/23/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 07-01)

Office Action Summary	Application No.	Applicant(s)	
	09/631,509	GUEST ET AL.	
	Examiner	Art Unit	
	Vincent P. Barth	2877	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-21 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-21 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Preliminary Comments

1. The rejections of Claims 5, 7, 12-15 and 20 pursuant to §112 are withdrawn.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims1-15, 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Michael, et al., U.S. Patent No. 6,173,070 (9 Jan., 2001), in view of Nichani, et al., U.S. Patent No. 6,298,149 (2 Oct., 2001).

4. Referring to Claim 1, Michael discloses a system for inspecting features of a component, combining two and three-dimensional techniques of inspection, and further generating control data. Michael discloses a system which locates and inspects the semiconductors using 3D data (col. 4, ln. 12), and wherein the features on the workpiece may be solders balls (col. 4, ln. 18). Michael further discloses that 2D coordinate data may be generated by Golden Template Comparison (GTC)(col. 10, ln. 35), and combined with 3D data. A description of the use of GTC in the context inspecting a plurality of features on semiconductors is found in Nichani (col. 2. lns. 7-14), and wherein an ideal reference image is stored in memory, following which the good reference image is subtracted from the test image to generate difference data to detect the

presence of features or objects. Although Nichani discloses that the GTC method is known, rather than pointing out the particular device for practicing the methods, it is clear that since the method is known, the devices and components for practicing the invention are necessarily known as well. Moreover, Michael discloses that the 3D captured image data may be used for further processing (col. 3., ln. 12). Following the acquisition of the 3D data, one embodiment in Michael involves the use of a robotic arm which manipulates the inspection device (col. 4, ln. 33). Thus, because the 3D data may be used to control other components, such may be characterized as "control data", as in the instant claim. Accordingly, since Michael suggests the motivation to incorporate the elements of Nichani with respect to 2D inspection, it would have been obvious to those skilled in the art at the time of the invention to combine the references. Moreover, Michael and Nichani are analogous art, since they are from the similar problem solving area, in that each involves inspecting semiconductors. The motivation for combining the features in the references would have been to obtain the benefit of both 3D and 2D analysis. Accordingly, it would have been obvious to those skilled in the art to combine the references, at the time of the invention, in order to obtain such benefit. See Medtronic, Inc. v. Cardiac Pacemakers, 220 USPQ 97 (Fed. Cir. 1983). Applicants have argued that the order in which the 3D and 2D data are processed is inflexible, but have set forth only circumstantial suppositions as to why the order is thus inflexible. In this connection, see MPEP §2144.04(IV)(C), citing In re Burhans, 69 USPQ 330 (CCPA 1946), (changing the order of performing steps is prima facie obvious, absent new or unexpected results). Here, Applicants have not shown new or unexpected results when combining the teachings of Michael and Nichani.

5. Referring to Claim 2, and as discussed above, Michael discloses the use of a robotic arm to control or manipulate the position of the inspection device with respect to the workpiece, rather than controlling the workpiece itself. However, since it is the *relative* position of the workpiece and the inspection apparatus that is critical, and since there is nothing in the nature of inspecting semiconductors which might prevent the use of these alternatives, they would be recognized as equivalent in the art at the time of the invention. Moreover, the robotic arm configuration is one exemplary embodiment, and if moving the workpiece proved more beneficial, those of ordinary skill in the art would have taken such measures, since the practice of moving workpieces pre-dates the use of robotic arms.

6. Referring to Claim 3, Nichani includes the storage of a reference image in memory (col. 2, ln. 11), following which a comparison to a test image is made to "analyze the difference to determine if the expected object ... is present" (col. 2., ln. 14). Phrased alternatively, so-called "difference data" is generated. As stated above, although Nichani discloses that the GTC method is known, rather than pointing out the particular device for practicing the methods, it is clear that since the method is known, the devices and components for practicing the invention are necessarily known as well.

7. Referring to Claim 4, Nichani does not explicitly state whether the reference image may be generated from a workpiece which is not to be tested, or the workpiece which will have solder bumps to be tested. However, it is common sense that if one where to make a comparison which would identify the new features of the object, one would make an image of the un-soldered workpiece *before* soldering, and then compare the image *after* the bumps were installed. Accordingly, using a workpiece which is not to be tested, rather than the workpiece which will

have solder bumps to be tested would have been obvious to those skilled in the art at the time of the invention.

8. Referring to Claim5, Nichani does not explicitly state whether the reference image may be generated from a workpiece which is not to be tested, or the workpiece which will have solder bumps to be tested. However, it is common sense that if one where to make a comparison which would identify the new features of the object, one would make an image of the un-soldered workpiece *before* soldering, and then compare the image *after* the bumps were installed. Accordingly, using a workpiece which is not to be tested, rather than the workpiece which will have solder bumps to be tested would have been obvious to those skilled in the art at the time of the invention.

9. Referring to Claim 6, Nichani includes a means for storing the location data from the 2D inspection (col. 2, ln. 11), and in which all of the feature data may be located. Moreover, Michael includes a computer with a memory system for storing the 3D inspection data (see Fig. 1, elements 28 and 30), and provides for combining the features of 2D and 3D inspection as discussed above. Accordingly, it would have been obvious to those skilled in the art at the time of the invention to combine the disclosures in Michael and Nichani.

10. Referring to Claim 7, Michael discloses the 3D inspection portion of the system is not limited to inspecting semiconductors, but may be adapted to recognize image data from radar, sonar, or other depth measuring devices (col. 10., ln. 60). Therefore, the disclosure in Michael is broad enough to include alternative illumination sources. Moreover, the most common component used in 3D measurement in the semiconductor industry is the laser, because of the precision for measuring small differences in height on three-dimensional surfaces. Accordingly,

the use of a laser in Claim 7 would have been obvious to those skilled in the art at the time of the invention.

11. Referring to Claim 8, Michael discloses the 3D inspection portion of the system is not limited to inspecting semiconductors, but may be adapted to recognize image data from radar, sonar, or other depth measuring devices (col. 10., ln. 60). Therefore, the disclosure in Michael is broad enough to include alternative illumination sources. Moreover, the most common component used in 3D measurement in the semiconductor industry is the laser, because of the precision for measuring small differences in height on three-dimensional surfaces. Accordingly, the use of a laser in Claim 8 would have been obvious to those skilled in the art at the time of the invention.

12. Referring to Claim 9, Michael discloses a system for inspecting features of a component, combining two and three-dimensional techniques of inspection, and further generating control data. Michael discloses a system which locates and inspects the semiconductors using 3D data (col. 4, ln. 12). Michael further discloses that two-dimensional coordinate data may be generated by Golden Template Comparison (GTC)(col. 10, ln. 35), and combined with 3D data. A description of the use of GTC in the context inspecting features on semiconductors is found in Nichani. A comparison to a test image is made to "analyze the difference to determine if the expected object ... is present" (col. 2., ln. 14), thus revealing the location of the feature and allowing for "location data" to be determined. Moreover, Michael discloses that the 3D captured image data may be used for further processing (col. 3., ln. 12). One embodiment in Michael involves the use of a robotic arm which manipulates the inspection device for 3D inspections. Because the 2D data may be used to control other components, for example the apparatus which

performs the 3D inspection, such may be characterized as "control data", as in the instant claim. Accordingly, since Michael suggests the motivation to incorporate the elements of Nichani with respect to 2D inspection, it would have been obvious to those skilled in the art at the time of the invention to combine the references.

13. Referring to Claims 10 and 11, , Nichani discloses a method in which a comparison to a test image is made to "analyze the difference to determine if the expected object ... is present" (col. 2., ln. 14), thus revealing the location of the feature. Therefore, phrased differently, so-called "difference data" and "location data" may be generated from the inspection steps. Claims 10 and 11 indicate respectively that a die base and a test die are to be compared to the test image. However, the methods in Nichani require only that a suitably good reference image be compared to the object to be inspected, thus the use of both the die base and test die would be consistent with such methods, and within the scope of Nichani. Applicants have argued that Nichani involves defect location, rather than feature location. However, in the first instance, a defect arguably <u>is</u> a feature, albeit a defective feature. Thus, the distinction is not persuasive. Moreover, Nichani should not be construed so narrowly, since the system pertains to machine vision inspection of leads, not merely defects (col. 1, lns. 33-35).

14. Referring to Claim 12, Michael discloses the 3D inspection portion of the system is not limited to inspecting semiconductors, but may be adapted to recognize image data from radar, sonar, or other depth measuring devices (col. 10., ln. 60). Therefore, the disclosure in Michael is broad enough to include alternative illumination sources. Moreover, the most common component used in 3D measurement in the semiconductor industry is the laser, because of the precision for measuring small differences in height on three-dimensional surfaces. Further,

Michael includes a computer with a memory system for storing the 3D inspection data (see Fig. 1, elements 28 and 30), or any other data such as that received from 2D inspections. Michael also discloses the use of a robotic arm which manipulates the inspection device (col. 4, ln. 33), for which the sequence of inspecting is clearly programmed from the 2D data. The robotic arm configuration is one exemplary embodiment, and if moving the workpiece proved more beneficial, those of ordinary skill in the art would have taken such measures, since the practice of moving workpieces pre-dates the use of robotic arms.

15. Referring to Claim 13, Michael discloses the 3D inspection portion of the system is not limited to inspecting semiconductors, but may be adapted to recognize image data from radar, sonar, or other depth measuring devices (col. 10., ln. 60). Therefore, the disclosure in Michael is broad enough to include alternative illumination sources. Moreover, the most common component used in 3D measurement in the semiconductor industry is the laser, because of the precision for measuring small differences in height on three-dimensional surfaces. Michael explicitly uses the 3D image data to inspect and determine the location of features such as solder balls (col. 4., lns. 9-17).

16. Referring to Claim 14, Michael explicitly uses the 3D image data to inspect and determine the location of features such as solder balls (col. 4., lns. 9-17), without limitation as to whether image data for all of the features are located.

17. Referring to Claim 15, Michael discloses that certain image data may be weighted to be disregarded (col. 5, lns. 6-12), which results from areas with noise or errors (col. 6, lns 16-17).

18. Referring to Claim 19, Michael discloses a system for inspecting features of a component, combining two and three-dimensional techniques of inspection, and further

generating control data. Michael discloses a system which locates and inspects the semiconductors using 3D data (col. 4, ln. 12), and wherein the features on the workpiece may be solders balls (col. 4, ln. 18). Michael further discloses that 2D coordinate data may be generated by Golden Template Comparison (GTC)(col. 10, ln. 35), and combined with 3D data. A description of the use of GTC in the context inspecting features on semiconductors is found in Nichani. Michael discloses the use of a robotic arm to control or manipulate the position of the inspection device with respect to the workpiece, rather than controlling the workpiece itself. However, since it is the *relative* position of the workpiece and the inspection apparatus that is critical, and since there is nothing in the nature of inspecting semiconductors which might prevent the use of these alternatives, they would be recognized as equivalent in the art at the time of the invention. Moreover, the robotic arm configuration is one exemplary embodiment, and if moving the workpiece proved more beneficial, those of ordinary skill in the art would have taken such measures, since the practice of moving workpieces pre-dates the use of robotic arms. Accordingly, it would have been obvious to those skilled in the art at the time of the invention to combine the teachings of Michael and Nichani.

19. Referring to Claim 20, Michael discloses the 3D inspection portion of the system is not limited to inspecting semiconductors, but may be adapted to recognize image data from radar, sonar, or other depth measuring devices (col. 10., ln. 60). Therefore, the disclosure in Michael is broad enough to include alternative illumination sources. Moreover, the most common component used in 3D measurement in the semiconductor industry is the laser, because of the precision for measuring small differences in height on three-dimensional surfaces. Accordingly,

the use of a laser in Claim 7 would have been obvious to those skilled in the art at the time of the invention.

20. Claims 16-18 and 21 are rejected under 35 U.S.C. 103(a) as obvious over Nichani, et al., U.S. Patent No. 6,298,149 (2 Oct., 2001).

21. Referring to Claim 16, Nichani discloses a method known in the art as Golden Template Comparison (GTC) (col., 2, lns. 7-14), which is used to locate features on semiconductors, and wherein a template reference image is stored in memory, following which the good reference image is subtracted from the test image to generate difference data to detect the presence of features or objects. A comparison to a test image is made to "analyze the difference to determine if the expected object ... is present" (col. 2., ln. 14), thus revealing the location of the feature. Phrased alternatively, so-called "difference data" is generated. Nichani does not explicitly state whether the first reference image may be generated from a workpiece itself before testing, or from another reference image, as long as the reference is sufficiently good to make comparisons. However, it is common sense that if one where to make a comparison which would identify the new features of the object, one would make an image of the un-soldered workpiece before soldering, and then compare the image subsequently. Accordingly, the method in Claim 16 would have been obvious to those skilled in the art at the time of the invention. Applicants have argued that Nichani involves defect location, rather than feature location. However, in the first instance, a defect arguably <u>is</u> a feature, albeit a defective feature. Thus, the distinction is not persuasive. Moreover, Nichani should not be construed so narrowly, since the system pertains to machine vision inspection of leads, not merely defects (col. 1, lns. 33-35).

22. Referring to Claim 17, Nichani does not explicitly state whether the feature to be installed is a contact bump, however the disclosure therein relates to leads on semiconductors. Accordingly, since soldering a ball or bump as a lead on a semiconductor is a common feature to install, the methods in Claim 17 would have been obvious to those skilled in the art at the time of the invention.

23. Referring to Claim 18, the GTC method disclosed in Nichani involves a representative component which is used to compare to a component with features. Moreover, it is common sense that if one where to make a comparison which would identify the new features of the object, one would make an image of the un-soldered workpiece before soldering, and then compare the image subsequently. Accordingly, the method in Claim 18 would have been obvious to those skilled in the art at the time of the invention.

24. Referring to Claim 21, Nichani discloses that the image data can be isolated by standard machine vision techniques, such as edge detection and/or tracking (col. 6, lns. 62-64).

CONCLUSION

25. Applicants' Claims 1-21 are rejected based on the reasons set forth above.

26. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

27. Any inquiries concerning this communication from the examiner should be directed to Vincent P. Barth, whose telephone number is 703-605-0750, and who may be ordinarily reached from 9:00 a.m. to 5:30 p.m., Monday through Friday.

28. If attempts to reach the examiner prove unsuccessful, the examiner's supervisor is Frank G. Font, who may be reached at 703-308-4881.

29. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1782.

Richard A. Rosenberger
Primary Examiner